exposition of the problem and his gallant attempt to solve it will, we hope, stimulate other biologists to follow in his footsteps and carry on the work to which his life was devoted, *i.e.* experimental embryology. E. W. M.

OUR BOOKSHELF.

The Heat Treatment of Tool Steel. By H. Brearley. Second edition. Pp. xv+223. (London: Longmans, Green and Co., 1916.) Price 10*s.* 6*d.* net.

THE fact that a demand has arisen for a second edition of this book within four years from its first appearance is the strongest evidence of its practical value. The author states in the preface that he is now less restrained than formerly, and is free to describe in greater detail the different methods of treating steel, and this has enabled him to deal with the subject much more completely than in the first edition.

For some time past, and especially during the stress of the last two years, it has been more fully realised than ever that the life of a tool will depend as much on the manner in which it is worked into the finished shape and on the heat treatment it receives as on the material from which it is made, and a record of the practical experience of the author will be of great value to all directly interested in procuring the best working results from the various steels used in the manufacture of tools.

For efficient handling, the subject demands an adequate knowledge of the science bearing on it, and familiarity with the results of recent research, together with a wide experience in workshop practice. The author possesses these qualifications to a high degree, and although the book deals more particularly with the practical than with the scientific aspect, it can be strongly recommended to all interested in this important subject either from the practical or from the more purely scientific point of view.

Alloy steels, and high-speed steels in particular, are more fully dealt with than was the case in the first edition, and the chapter on case-hardening has been omitted, as it has been made the subject of a separate volume.

The whole subject is well handled, and the book can be strongly recommended as a clear and comprehensive treatise on this important branch of technology. F. W. HARBORD.

Laboratory Manual in General Microbiology. Pp. xvi+418. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1916.) Price 10*s.* 6*d.* net.

THIS book is planned to serve as a manual of instruction in practical microbiology. To a large extent it represents the course given in this subject at the Michigan Agricultural College, and it therefore deals mostly with agricultural microbiology, and the disease-producing organisms, with two or three exceptions, are omitted.

The course is divided into 126 lessons or exercises, of which 53 are devoted to general laboratory methods and to the general morphology of micro-organisms, 33 to the physiology of micro-organisms, 15 to air, water, sewage, and soil, 11 to dairy and plant microbiology, and 14 to animal diseases and immunity.

Each lesson is detailed under a definite plan—the apparatus required, the cultures necessary, and the method of carrying out the exercise. At the end of each lesson questions are asked regarding the particular results that may be obtained and their significance.

The details given for each lesson are sufficiently full to enable the student to work independently of a teacher, and anyone who were to follow them out would possess a good practical knowledge of the subjects dealt with.

Formulæ for stains and special culture media, tables of the coliform organisms, metric and other tables, and a list of works of reference are given in an appendix, and the text is illustrated with a number of plates and figures.

The work should be of considerable value as a laboratory handbook to both teacher and student, and we can cordially recommend it for this purpose. R. T. HEWLETT.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Pre-Columbian Use of the Money-Cowrie in America.

THE letter entitled "Pre-Columbian Use of the Money-Cowrie in America," by Mr. J. Wilfrid Jackson (NATURE, September 21, p. 48), offers a discouraging instance of superficial reading of carefully observed and recorded data.

In 1915 Mr. Clarence B. Moore unearthed, in the Roden Mound in northern Alabama, five cowries (*Cypraea moneta*). These shells, which came from a burial in the body of the mound, had been pierced for stringing, and showed evidence of considerable age. They were the only evidence found at this site of contact with the Old World (C. B. Moore, "Aboriginal Sites on Tennessee River," in Journ. Acad. Nat. Sci., Philadelphia, second series, xvi., p. 293). In all Mr. Moore's more than twenty years of most careful and painstaking exploration of mounds, cemeteries, and dwelling sites of the southern United States, from the Atlantic coast to Texas, and from the Ohio River to the Gulf of Mexico, no previous instance of the finding of *C. moneta* had been noted by him, nor has it ever been recorded as occurring with American pre-Columbian remains. The logical conclusion from the mass of this negative evidence is that the Roden Mounds were, in part, early post-Columbian, and that any other evidence of contact they may have contained was of a perishable nature. To assume, on the basis of this string of shells, the pre-Columbian use of the cowrie in America is no more justified than to claim for iron working a pre-Columbian age in the western hemisphere on the evidence of the iron celts found by the same Tennessee River expedition in Citico Mound, where absolutely nothing else save four glass beads from a superficial burial suggested the white trader and his wares. In each instance the presence

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of these Old World materials dates the grave as later than 1492.

In the fifteenth and early sixteenth centuries the "porcelain shell," or cowrie, was the trade medium for both the Orient and Africa, for which purpose it was strung.

In a recent statement to the present writer, Dr. William H. Dall, the foremost of ethno-conchologists, so expressed himself:—"I think the presence of *C. moneta* in a mound is evidence that the deposit is post-Columbian. Columbus believed that he was on a voyage to the (East) Indies, and no voyager of his day would have fitted out a ship for that goal without including the money-cowrie in his trade goods. That the records make no mention of them is probably due to their being considered too much a matter of course."

Moreover, strings of cowries were a part of the trappings of a gentleman's mount, and, in this capacity, some are likely to have reached the southern United States in the days of its earliest exploration.

The *C. moneta* which Mr. Wilfrid Jackson erroneously states was found *in* the Serpent Mound, Ontario, is recorded by Mr. Montgomery as among the objects "which were found in the same locality, some of them last year, and others previous to that time. Some of these were discovered upon the mounds or near them; others were either found upon the surface of the ground or ploughed up in the neighbouring fields. A few were obtained about four miles distant from the mounds" (Trans. Canadian Institute, ix., 1910, p. 6). Mr. Montgomery himself says of the artifacts in this enumeration:—"Nothing can be positively stated as to who their manufacturer was." The shell was unpierced, and there is nothing in the record, so far as published, to prove that it was ever in the possession of an aboriginal American.

As for the Cree dress, decorated with cowries, collected by the Lewis and Clark expedition, and described by Mr. Willoughby (*American Anthropologist*, 1905, p. 640), does Mr. Wilfrid Jackson maintain that the blue glass beads and brass buttons which adorned the opposite side of this shirt are also of pre-Columbian date? In sooth, it proves nothing. In 1804–5 the Cree were in close trade relations with the Hudson Bay Company, and had been in touch with the white man for more than a century and a quarter.

The modern use of the cowrie in the ancient ceremonies of the Ojibwa and Menomini tribes, cited by Mr. Jackson, is likewise wholly inconclusive of the antiquity of *C. moneta* as a culture object. Hoffman, describing "The Midéwiwin, or 'Grand Medicine Society' of the Ojibwa" (Bureau of American Ethnology, vii., Ann. Rept., 1885–6), states:—"The mígis is considered the sacred symbol of the Midéwigan, and may consist of any small white shell, though the one believed to be similar to the one mentioned in the above tradition resembles the cowrie. . . . It is admitted by all the Midé priests whom I have consulted that much of the information has been lost through the death of their aged predecessors" (p. 167). On p. 191 Hoffman again refers to "the mígis, a small white shell (*C. moneta*, L.)," and on p. 220 he further states:—"The mígis referred to in this description of the initiation consists of a small white shell, of almost any species, but the one believed to resemble the form of the mythical mígis is similar to the cowrie, *C. moneta*, L. . . . Nearly all of the shells employed for this purpose are foreign species, and have no doubt been obtained from the traders. The shells found in the country of the Ojibwa are of rather delicate structure, and it is probable that the salt-water shells are employed as a substitute, chiefly because of their less frangible character."

The related Menomini, in their corresponding ceremony, were undoubtedly using the money-cowrie as a culture object in 1890 (Hoffman, "The Menomini Indians"; Bureau of American Ethnology, xiv., Ann. Rept., p. 101), but the earliest records of the doings of this medicine society are not so convincing of the identity of the shell employed (*e.g.* Schoolcraft, "Indian Tribes," iii., p. 287). Dr. Dall has kindly permitted me to quote his private communication as follows:—"I believe the cowrie to be a comparatively late substitution, in the ceremonies of the Ojibwa and associated tribes, for some native American shell formerly used by them, just as, after the coming of the traders, the exotic *Dentalium tarentinum* rapidly replaced the smaller and more fragile *D. indianorum*, which was so highly esteemed by the West Coast tribes. The marine shell, *Marginella apicina*, which was traded up from the Gulf Coast in large quantities, in pre-Columbian and early post-Columbian times, is likely to have been the object, 'in shape and colour like a small bean,' which was thrown at the novice in the Black Dance ceremony of the Dakota, according to the earlier narrative used by Jonathan Carver in 1778 (Bureau Amer. Ethnol., Ann. Rept., xiv., p. 112). Fletcher's report of the corresponding ceremony of the Winnebago, where they used 'a small white seashell about the size of a bean' (*ibid.*, p. 110), exactly fits the Marginella."

The case thus rests entirely on Mr. Moore's find, and in the face of perhaps a hundred thousand aboriginal graves innocent of cowries, to construe the single instance of Roden Mounds as evidence of prehistoric acculturation is to sire the concept by a wish.

H. NEWELL WARDLE.

The Academy of Natural Sciences of Philadelphia.

THE question of the pre-Columbian use of the money-cowrie in America is fully discussed by me in an exhaustive memoir, dealing with the use of cowries as cult objects in the Old and New Worlds, which is on the eve of publication by the Manchester Literary and Philosophical Society. (It will probably be published by the time this letter appears in print.) The whole subject is too vast to be discussed in a short letter, but the following remarks may be offered on the criticism levelled by Mr. H. Newell Wardle at my letter in NATURE of September 21.

The evidence provided by the remarkable discovery by Mr. C. B. Moore of shells of the money-cowrie, *C. moneta*, in the Roden Mound, where they were associated with a human skull, forms merely one link in the remarkably complete chain of cultural connection between the Old World and the New in pre-Columbian times. There are other equally suggestive facts, which point conclusively in the same direction, including the significant use of large stone cists for burial purposes in the immediate neighbourhood of the place where the cowries were found, as well as elsewhere in America.

The custom of placing money-cowries in graves with the dead is a widespread Old World practice, which has a definite and wholly arbitrary significance; and it ranges in time from pre-dynastic Egypt to the present day.

As for the Cree dress decorated with cowries, I do not pretend to claim that the actual dress, with its blue glass beads and brass buttons, is of pre-Columbian date; but the idea of using cowries to decorate such a dress, which again has a very precise meaning in Africa and southern and eastern Asia, was certainly not so recent as the brass buttons suggest. To imagine that the Hudson Bay Company introduced such Oriental customs, or even knew of their existence, is surely crediting these traders with an extent of ethnological knowledge and enthusiasm for disseminating exotic beliefs, with a strong Indonesian colour, which I am not sufficiently imaginative to admit.

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